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DESIGN MEMORANDUM #1

To: Mr. Frank Styers Superintendent of Capital Projects City of Wilmington 305 Chestnut, Street Wilmington, NC 28401	Copies: Charles Adams, COW Tom Ames, III, TWB Jim Craig, NHC Bill Justice, COW Gary McSmith, NHC Greg Thompson, NHC Ken Vogt, COW Michael Vukelich, TWB
Date: February 14, 2007	KHA Proj. No.: 011335022
From: Jeremy Rivenbark, P.E. J. Chris Ford, P.E.	
Subject: Design Memorandum # 1 – Routing Analysis for Relocation of the 24-inch Force Main along Hewlett's Creek from COW PS 34 to Cascade Road Northeast Interceptor Interim Improvements	

1 Introduction

In an effort to further improve the reliability of the Northeast Interceptor (NEI) system, the Preliminary Engineering Report recommended that the section of the existing 24" force main paralleling Hewlett's Creek (approximately 7,000 linear feet), between City of Wilmington Pump Station 34 (COW PS 34) and Cascade Road, be relocated out of the wet area of the creek as part of the NEI interim improvements. This was recommended for the following reasons:

- The area is difficult to access given the swampy conditions. This situation makes the force main difficult and costly to inspect, maintain, and repair in the event of a spill. This inaccessibility would lengthen the time for identification and repair of a failure, increasing the volume of a spill.
- The existing gravity sewer is immediately adjacent to the existing force main. There have been reported instances of damage to the force main during construction of the gravity system. Two of these repairs failed near Warlick Drive, resulting in spills. If other repairs were made with similar materials, there are risks of additional failures.
- The area is characterized by corrosive soils. The force main was originally installed with a polyethylene liner to protect the pipe. Given the proximity of the gravity sewer to the NEI, damage to the liner is likely. Without the protective liner, there is the potential for corrosion and failure.

- Leaks in this area are hard to identify and locate given the wet conditions. Also, any leaks not immediately repaired would directly influence surface waters given the proximity to the creek.

Accordingly, KHA conducted thorough site investigations to evaluate routing alternatives for the replacement and relocation of the portion of the Northeast Interceptor (NEI) in vicinity of Hewlett's Creek.

2 Route Alternatives

Three route alternatives have been identified that extend west from Pump Station 34 on Pine Grove Drive to connection points on the existing 24-inch force main along Cascade Road. These routes are identified as follows:

- 1) Alternative 1.1 – Pine Grove Drive and Holly Tree Road Route
- 2) Alternative 1.2 – Pine Grove Drive and Brightwood Road Route
- 3) Alternative 1.3 – American Legion, Wilmington Municipal Golf Course, and Mockingbird Lane Route

The routes range from approximately 1.1 to 1.3 miles and are depicted in Figure DM-1.1

2.1 Alternative 1.1 – Pine Grove Drive and Holly Tree Road Route

2.1.1 Route Description

Alternative 1.1, as depicted in Figure DM-1.1 and DM-1.2, begins at COW PS 34 and follows Pine Grove Drive south to the intersection with Holly Tree Road (see Exhibit 1.1A). At this intersection, the force main would follow Holly Tree for approximately 0.8 miles west past Warlick Drive (see Exhibit 1.1B) to the existing sanitary sewer easement west of Web Trace. The force main would then extend north within this existing easement to the current NEI easement along Hewlett's Creek. A directionally drilled crossing could be required through a small wetland area along Hewlett's Creek in order to minimize environmental permitting requirements. The force main would then follow the existing easement northwest to the end of Cascade Drive, where the new relocated force main would connect into the existing force main. Additionally, this route could be used as an alternative for a parallel force main from PS 35 to the Southside Wastewater Treatment Plant. Alternative 1.1 is approximately 5,800 feet long from COW PS 34 to Cascade Road.

2.1.2 Existing Land Use Characteristics

Holly Tree Road serves as a main connector between South College Road and Pine Grove Drive. Both Holly Tree Road and Pine Grove Drive are characterized with a 60-foot right-of-way. In this area, Pine Grove Drive and Holly Tree Road provide access to several residences and residential neighborhoods via individual residential driveways and connecting subdivision street intersections. Immediately south of COW PS 34 on Pine Grove Drive, wetlands on both sides of the road reduce the

available shoulder width for accommodation of the proposed utility. Sidewalks are located on both sides of Holly Tree Road for a majority of the length, as well as a portion of Pine Grove Drive near the intersection with Holly Tree. Several brick barrier walls and earthen landscape berms, shown in Photo 1.1.1, are located immediately outside of the right-of-way on Holly Tree Road as well. The existing sanitary sewer easement near Web Trace that could be utilized as a corridor down to Hewlett's Creek and Cascade can be seen in Photo 1.1.2.



Photo 1.1.1 - Barrier walls and sidewalk along Holly Tree Road



**Photo 1.1.2 - Existing Sanitary Sewer Easement off of Holly Tree Road
near Hewlett's Creek and Cascade**



Photo 1.1.3 - View of Pine Grove Right-of-way looking toward COW PS 34



Photo 1.1.4 - View of intersection of Pine Grove and Holly Tree right-of-way



Photo 1.1.5 - View of typical utility placement and walls along Holly Tree
Note gas, water, and communications all between back of curb and R/W

2.1.3 Existing Utilities

Following identification and review of the proposed corridors, existing utilities were investigated through review of GIS data, private utility company records and maps, field observations, and selected utility locates. The locations of existing utilities in relation to the road surface and right-of-way boundary were noted and used to analyze potential conflicts with the proposed force main and to determine the most feasible location.

The existing utilities identified are as follows:

Pine Grove Drive

- pole mounted OHP along eastern side of the roadway near the right-of-way line
- 12" DIP water on east side of the road at the edge of pavement
- 10" PVC/DIP sewer along the western side of the road approximately 1.5 feet off the edge of pavement
- gas line on the west side of the road approximately 17 feet off the edge of pavement
- fiber optic and other communications cables on west side of road 11-15 feet off the edge of pavement and following the edge of pavement and the sidewalk on the eastern side

Holly Tree Road

- 8" DIP water on the southern side of the road wandering from the edge of pavement to underneath the sidewalk
- 8" DIP sewer on the northern side of the road near Warlick Drive.
- pole mounted OHP along the southern right-of-way line
- additional gravity sanitary sewer of unknown material just south of the Holly Tree right-of-way between Warlick and Wellington.
- additional connecting waterlines feeding neighborhood water systems both north and south of Holly Tree
- fiber optic and other communications cables on both sides of Holly Tree, mainly concentrated in the areas between the back of curb and the right-of-way line
- gas mains along the southern right-of-way line of Holly Tree

Existing Sanitary Sewer Easement

- 8" PVC sewer between Holly Tree and Hewlett's Creek near Web Trace.

Both Pine Grove Drive and Holly Tree Road have many utilities in the existing right-of-ways limiting available space for accommodating the proposed force main within the right-of-way but outside of the pavement area. Consequently, probable routes for additional force main would likely follow within the existing roadway or new utility easements adjacent to the roadways.

2.1.4 Required Easements

Alternative 1.1 attempts to utilize existing right-of-way to limit the need to acquire additional easements from property owners. However, with limited unoccupied right-of-way available for additional utilities, it may be necessary to obtain easements to facilitate installation of a new force main(s) along Pine Grove Drive and Holly Tree Road. Because this is a residential area, easement acquisition would involve numerous property owners. Such easements would also likely necessitate significant restoration of landscaping and privacy walls. Furthermore, additional easement width would likely be required should a new parallel force main from PS 35 also follow this route.

2.1.5 Long Term Maintenance Characteristics

The preferable force main location would generally fall within maintained shoulder areas or beneath pavement along Holly Tree Road and Pine Grove Drive. Holly Tree Road has many existing utilities which limit available space for the relocated force main. Force main installed within these areas would place it in close proximity to the existing utilities, increasing the difficulty of future modifications or repairs and necessitating that some traffic be shut down or rerouted. Desired spacing between utilities is not attainable along much of this route unless easements are acquired or the force main is routed within the pavement section. Such an alternative would be costly for both construction and maintenance.

2.1.6 Probable Alignment

Given the high concentration of utilities along the shoulders and sidewalk areas of Holly Tree Road and Pine Grove Drive, the proposed force main would likely be located within the pavement section of both roadways. Obtaining an NCDOT encroachment agreement as well as traffic control during construction would be problematic given the urgency of the relocation. Also, the proximity of the existing developments leaves little room for easement acquisition and subsequent force main construction. Numerous easements would be required for the length of the route. Due to the difficulty of construction and the time required for easement acquisition, this alternative would likely require a lengthier schedule. The probable project cost for Alternative 1.1 is projected to be approximately \$2.06 million as depicted in Table 1.

2.2 Alternative 1.2 – Pine Grove Drive and Brightwood Road Route

2.2.1 Route Description

Alternative 1.2, as depicted in Figure DM-1.1 and DM-1.2, follows Pine Grove Drive north past Greenville Loop Road to Brightwood Road (Exhibit 1.2A and Exhibit 1.2B). The force main would then follow the southern portion of Brightwood Road west toward Brightwood Court, where it would cut between two existing residences to a heavily wooded wetlands area. Heading northwest, the route would then follow the northern edge of the wetland area adjoining Hewlett's Creek behind several residences on the southern side of Mockingbird Lane. As the route approached Cascade Road, it would then extend between two existing residences and connect into the existing 24-inch force main along Cascade. This route could also be used as an alternative for a the parallel force main from COW PS 35 to the Southside Wastewater Treatment Plant, currently under evaluation. Alternative 1.2 is approximately 6,100 feet long from COW PS 34 to Cascade Road.



Photo 1.2.1 - Intersection of Pine Grove Drive and Brightwood Road

2.2.2 Existing Land Use Characteristics

The portion of the proposed route north of COW PS 34 on Pine Grove Drive is characterized by several businesses with approximately 60-feet of NCDOT right-of-way near the intersection with Greenville Loop Road. Brightwood Road has a 60-foot right-of-way with single family residences located approximately 50-feet from the right-of-way lines as shown in Photo 1.2.2. West of the homes on Brightwood Court, a forested wetland area as designated on National Wetlands Inventory mapping, is evident along Hewlett's Creek. A proposed utility easement would likely cross near or within these wetland areas adjacent to Hewlett's Creek. Additional easements would be required behind residences on Mockingbird Lane to cross more than 20 properties. After review of mapping and aerial photography, it appears unlikely that adequate upland area exists within the wooded portions of these properties to accommodate a proposed force main without close encroachments to existing residences. Crossings would entail bisecting many properties and would likely place the proposed pipeline 15-60 feet from existing homes and structures. An existing drainage ditch was observed perpendicular to Mockingbird Lane between Cascade and Wintergreen Roads. A route following south of Mockingbird would require a crossing of the ditch in addition to wetlands associated with it and Hewlett's Creek.

2.2.3 Existing Utilities

Following identification and review of the proposed corridors, existing utilities were investigated through review of GIS data, private utility company records and maps, field observations, and selected utility locates. The locations of existing utilities in relation to the road surface and right-of-

way boundary were noted and used to analyze potential conflicts with the proposed force main and to determine the most feasible location.

The existing utilities identified are as follows:

Pine Grove Drive

- 12" DIP water on the east side of Pine Grove Drive north of Greenville Loop located within or along the eastern edge of the pavement approximately 15 feet from the right-of-way
- 8" and 12" waterlines south of Greenville Loop within the northbound travel lanes
- 8" PVC sewer along the western edge of pavement of Pine Grove
- existing and proposed NEI sewers tributary to COW PS 34 within the eastern shoulder of Pine Grove south of Greenville Loop
- gas main approximately 5 feet from the western edge pavement along Pine Grove which is approximately 5 feet from the right-of-way line
- fiber optic and communications cables on the west side of road underneath the sidewalk and approximately 5 feet from the eastern edge of pavement

Brightwood Road

- OHP/communications on both sides of the road near the right-of-way lines
- 8" DIP water on north side of road centered between the edge of pavement and the right-of-way line, placing it about 8 feet off the edge of pavement
- 8" PVC sewer on south side of road approximately 2-5 feet from the edge of pavement

Brightwood Court

- OHP/communications running down a center median on the street
- 2" PVC water near the outer edge of pavement for the perimeter of the cul-de-sac
- 8" PVC sewer along the southern side of the center median on the street

Mockingbird Lane

- no utilities other than private power services to out buildings and miscellaneous residential services such as yard piping and area lighting

Alternative 1.2 would require the proposed route to travel between residences in two separate locations, as well as along the boundary of the existing wetlands. Utilizing a new route for much of proposed path would greatly minimize conflicts with existing utilities. While Brightwood Road and Brightwood Court have limited existing buried utilities, Pine Grove Drive has water, gas, sewer, and fiber optic cable buried in the right-of-way.



Photo 1.2.2 - Brightwood Road corridor facing west

2.2.4 Required Easements

As few as three easements may be required from residences on Brightwood Lane and Brightwood Court. In order to make the passage into and out of the forested, wetland area behind the residences, at least a 20-foot easement between two properties (224 Brightwood Court, 226 Brightwood Court, and 228 Brightwood Court) would need to be obtained on Brightwood Court. An example of a possible easement corridor in the area is shown in Photo 1.2.3. Along the north edge of the wetland area, a 30-foot easement would likely be required behind approximately twenty residences on the south side of Mockingbird Lane from Brightwood Court to Cascade Road. Furthermore, additional easement with may be required if the new force main from COW PS 35 were to utilize this route.



Photo 1.2.3 - Possible easement acquisition area between residences on Brightwood Court



Photo 1.2.4 - View of western shoulder area along Pine Grove at Greenville Loop. Note communications and gas main locates.

2.2.5 Long Term Maintenance Characteristics

Brightwood Road and potential easement acquisitions behind Mockingbird Lane both have wide corridors with limited or no existing underground utilities, which provides adequate room for the proposed utilities. Major power and communication lines are overhead along Brightwood Road. With room for proper spacing of proposed utilities, future incidental damage risk is limited. However, Alternative 1.2 also increases the difficulty for maintenance and monitoring access, since the force main would most likely still be in somewhat wet areas associated with Hewlett's Creek. Land behind the existing residences is not currently developed because it is typically wet and subject to periodical flooding. Although, surface restoration other than seeding would be minimal for construction, much of the route would require regular mowing and upkeep. The remaining portions of the route would fall within maintained shoulder areas or pavement areas.

2.2.6 Probable Alignment

Given the high concentration of utilities along the shoulders and the sidewalk areas along Pine Grove Drive and Brightwood Road, the location of the proposed force main would likely be within the pavement sections. There is however, ample space for dedicated utility easements outside the right-of-way if construction within the roadway is not desired. Due to the construction within Pine Grove Road and the time required for easement acquisition, this alternative would likely require a lengthier schedule. The probable project cost for Alternative 1.2 is projected to be approximately \$2.09 million as depicted in Table 2.

2.3 Alternative 1.3 – American Legion, Wilmington Municipal Golf Course, and Mockingbird Lane Route

2.3.1 Route Description

Alternative 1.3, as depicted in Figure DM-1.1 and DM-1.2, follows Pine Grove Drive north from existing COW PS 34 to the American Legion Property, which is adjacent to the Wilmington Municipal Golf Course (see Exhibit 1.3A). At the American Legion property, the route would run west along the American Legion and Wilmington Municipal Golf Course property line (Photo 1.3.1) toward Mockingbird Lane. The route would then turn northwest in the wooded area near the southwestern corner of the Wilmington Municipal Golf Course, to the intersection of Mockingbird Lane and Pine Cone Road (see Exhibit 1.3B). Alternatively, the force main could also utilize the open areas of the Municipal Golf Course to route from Pine Grove Drive to Mockingbird Lane. This route would require negotiating around tee boxes and greens. After traversing the golf course, the proposed route would then follow Mockingbird Lane west, passing Wintergreen Road (Exhibit 1.3C), to Cascade Road (Exhibit 1.3D). A line of trees could be preserved between the route and the actual golf course area to buffer any sight of the new force main easement area. In addition, this route could also be used as an alternative for the proposed parallel force main from COW PS 35 to the Southside Wastewater Treatment Plant currently under evaluation. Alternative 1.3 is approximately 6,700 feet in length from COW PS 34 to Cascade Road.



Photo 1.3.1 - Parking lot and driveway on north edge of American Legion property

2.3.2 Existing Land Use Characteristics

Businesses and single family residences are located along Pine Grove Drive between COW PS 34 and the American Legion property. Pine Grove Drive has a 60-foot right-of-way. Existing trees are present along the American Legion and Wilmington Municipal Golf Course property line as shown in Photo 1.3.2 and 1.3.3. The American Legion parking lot is located south of the golf course property line. West of the American Legion property is the forested wetland area along Hewlett's Creek. Mockingbird Lane and Cascade Road both have approximately 60-foot wide right-of-ways with limited obstacles in the right-of-way. An arched 8' x 15.5' culvert passes under Mockingbird Lane between Cascade Road and Wintergreen Road. Guardrails are located on both sides of Mockingbird Lane at the culvert crossing where the right-of-way and shoulder narrows. The City has indicated that routing the force main across the Municipal Golf Course would be acceptable. If the route does not cross the golf course, an easement would be required from the American Legion that would extend the length of the north property line. Care should be taken to minimize a loss of trees along the property line and within the golf course. Overall, limited utilities are present along the majority of the route.



Photo 1.3.2 - American Legion on east side of Pine Grove Drive



**Photo 1.3.3 - Westerly view from Pine Grove of the municipal golf course
Area depicted is adjacent to the American Legion property.**



Photo 1.3.4 - View from the municipal golf course near Mockingbird Lane

2.3.3 Existing Utilities

Following identification and review of the proposed corridors, existing utilities were investigated through review of GIS data, private utility company records and maps, field observations, and selected utility locates. The locations of existing utilities in relation to the road surface and right-of-way boundary were noted and used to analyze potential conflicts with the proposed force main and to determine the most feasible location.

The existing utilities identified are as follows:

Pine Grove Drive

- 12" DIP water on the east side of Pine Grove Drive north of Greenville Loop Road within or along the eastern edge of the pavement approximately 15 feet from the right-of-way
- 8" and 12" waterlines located south of Greenville Loop Road within the northbound travel lanes
- 8" PVC sewer along the western edge of pavement of Pine Grove Drive
- existing NEI sewers tributary to COW PS 34 are located within the eastern shoulder of Pine Grove Drive south of Greenville Loop Road
- a gas main approximately 5 feet from the western edge pavement along Pine Grove which is approximately 5 feet from the right-of-way line

- fiber optic and communications cables on the west side of road underneath the sidewalk and approximately 5 feet from the eastern edge of pavement

Municipal Golf Course

- miscellaneous power outlets and course irrigation lines
- under-drain systems likely in and around the greens and tee boxes

Mockingbird Lane

- OHP/communications on both sides of the road near the right-of-way lines
- 8" PVC water on the north side of road near the northern edge of pavement
- 8" PVC sewer on the south side of road near the southern right-of-way approximately 15 feet off the southern edge of pavement

Cascade Road

- 8" PVC/DIP sewer on the western side of the road approximately 5 feet off the edge of pavement north of Mockingbird Lane
- 8" gravity sewer along the eastern edge of pavement south of Mockingbird Lane
- 24" NEI force main along the eastern right-of-way along Cascade Road
- 8" PVC water at the northern edge of pavement of Cascade Road north of Mockingbird Lane
- 8" PVC water approximately 5 feet off the western edge of pavement of Cascade Road south of Mockingbird Lane
- OHP/communications on north and eastern side of the road near the right-of-way line

2.3.4 Required Easements

Alternative 1.3 could require a partial 10 to 20 foot wide easement along the north edge of the American Legion property bordering the Wilmington Municipal Golf Course from Pine Grove Drive to the wetlands area. The remainder of the force main to Pine Cone Road would be located on the City-owned golf course and will not require any easement. Additional easement may be required if the proposed parallel force main from COW PS 35 utilizes this route. Conversely, should the golf course routing utilize only the golf course property, rather than encroaching on the American Legion property, no additional easements would be required.

2.3.5 Long Term Maintenance Characteristics

Much of the Alternative 1.3 route is in areas with adequately sized corridors and limited existing utilities and obstacles. In the future, the mains will be easily accessible for maintenance and repair as the route utilizes existing roadways with limited utilities and new easements. Maintenance access points for monitoring and repair will be easily accessible for the entire length. By utilizing the golf course and maintained shoulder or pavement areas, the majority of this route would require no mowing and upkeep.

2.3.6 Probable Alignment

Given the high concentration of utilities along the shoulders and sidewalk areas along Pine Grove, the location of a proposed force main would likely be within the pavement sections or near the eastern edge of pavement. Ample space for dedicated utility easements exists for the route along Pine Grove to minimize pavement disturbance if deemed desirable. This time necessary for easement acquisition however, could delay construction schedules. No other additional easements are anticipated for the municipal golf course or Mockingbird Lane. Once leaving Pine Grove Road, the force main would likely extend across the golf course and then along the northwest side of Mockingbird Lane between the water main and the property line to the connection with the existing NEI force main on Cascade Road. The probable project cost for Alternative 1.3 is projected to be approximately \$1.96 million as depicted in Table 3.

2.4 Comparison Analysis of Hewlett's Creek from COW PS 34 to Cascade Road

Evaluation of the routing alternatives for relocation of the 24-inch force main along Hewlett's Creek has yielded the following advantages and disadvantages:

Alternative 1.1 – Pine Grove Drive and Holly Tree Road Route

- Advantages:
 - shortest route
 - system could be easily monitored for routine inspections via windshield surveys
- Disadvantages:
 - proximity to and conflicts with existing utilities along Holly Tree Road
 - potential easement acquisition of properties along Holly Tree Road and Pine Grove Drive or placement within existing pavement
 - potential directional drill crossing Hewlett's Creek
 - heavy traffic along Pine Grove Drive and Holly Tree Road that would require traffic control or rerouting during construction.

Alternative 1.2 – Pine Grove Drive and Brightwood Road Route

- Advantages:
 - fewer existing utilities
 - few anticipated easements
- Disadvantages:
 - maintenance issues with potentially wet easements behind numerous residences on Mockingbird Lane
 - likely delay of construction due to the acquisition of approximately 20 easements along properties south of Mockingbird Lane
 - inconvenience to several residences where new easement would run between their home resulting in removal of a significant amount of trees on private properties

- narrow “pinch points” to get the proposed force main between existing structures on Brightwood Court

Alternative 1.3 – American Legion, Wilmington Municipal Golf Course, and Mockingbird Lane Route

- Advantages:
 - all portions would fall within existing rights-of-way or City owned property with the exception of possibly one easement
 - fewer existing utilities, some portions (i.e. golf course) have little conflicting utilities
 - easily accessible for maintenance and inspections.
 - minimal paved surface restoration
 - projected to be the most cost effective option
 - construction is anticipated to proceed more rapidly due to lack of easement acquisition and less pavement restoration than the other options
- Disadvantages:
 - longest route

3 Conclusions and Recommendations

Although longer, Alternative 1.3 affords the City the opportunity to quickly and efficiently begin construction of this relocation. The entire route will follow existing right-of-ways and City owned property providing easy access and eliminating or minimizing the number of easements required. This route also provides the least intrusive construction environment for maintenance of traffic and protection of existing utilities. The cost of this route is projected to be \$2,030,000. This compares to estimates of \$2,060,000 and \$2,090,000 for Alternatives 1.1 and 1.2 respectively, so there is essentially little difference in cost. We therefore recommend that the City proceed with design of the relocated force main in accordance with Alternative 1.3.

TABLES

Table 1 - Alternative 1.1 Opinion of Probable Project Cost

Item	Item Description	Unit	Estimated Quantity	Unit Price	Total Cost
1.	24" FM	LF	5,360	\$195	\$1,045,200
2.	Directional Drill	LF	440	\$340	\$149,600
3.	Jack & Bore	LF	70	\$1,050	\$73,500
4.	Asphalt Replacement	SY	3,500	\$50	\$175,000
5.	Traffic Control	LS	1	\$27,000	\$27,000
Sub-Total					\$1,470,300
Contingency (20%)					\$294,100
Technical Services					\$293,200
Easements					\$0
Total Projected Cost					\$2,060,000

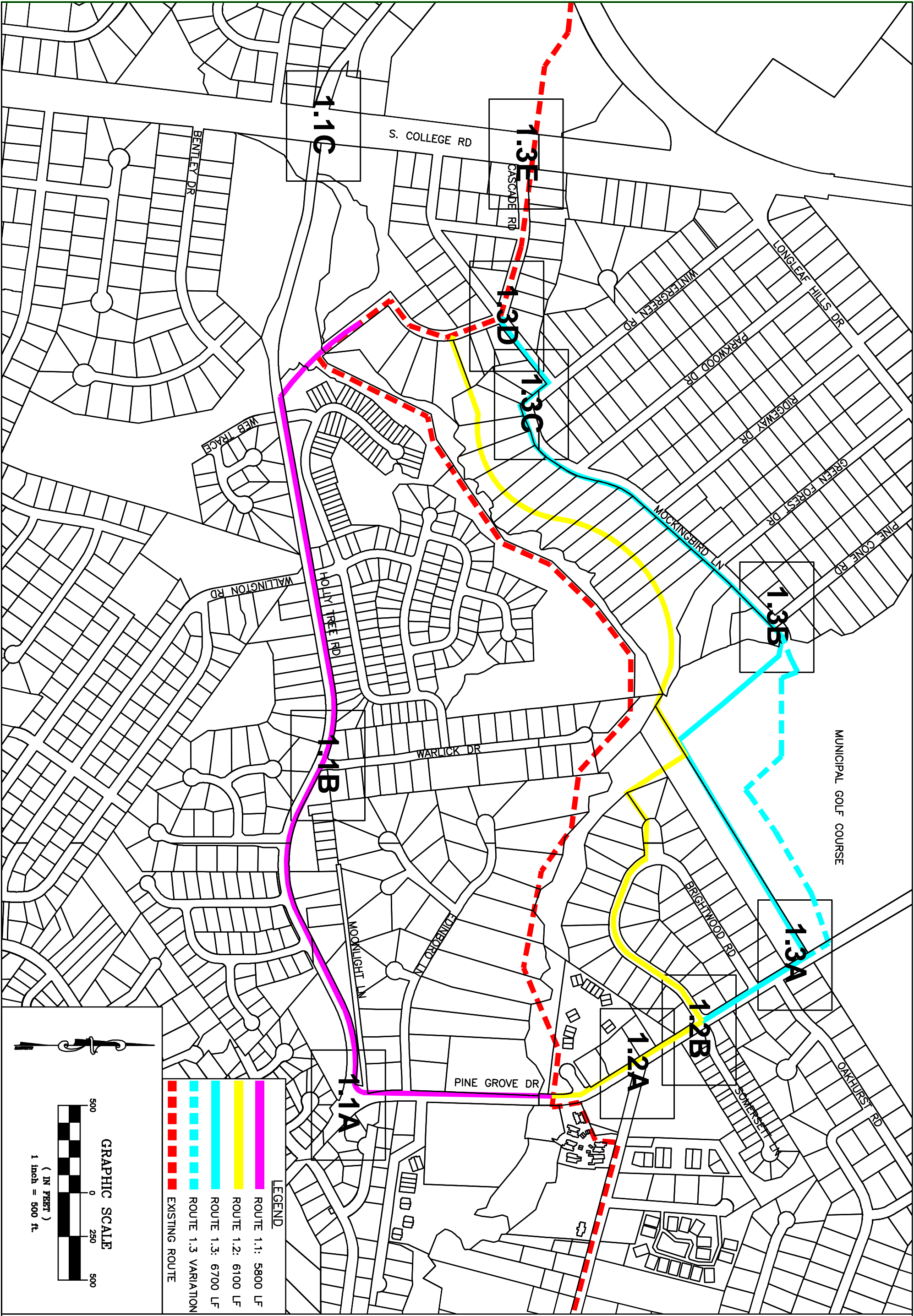
Table 2 - Alternative 1.2 Opinion of Probable Project Cost

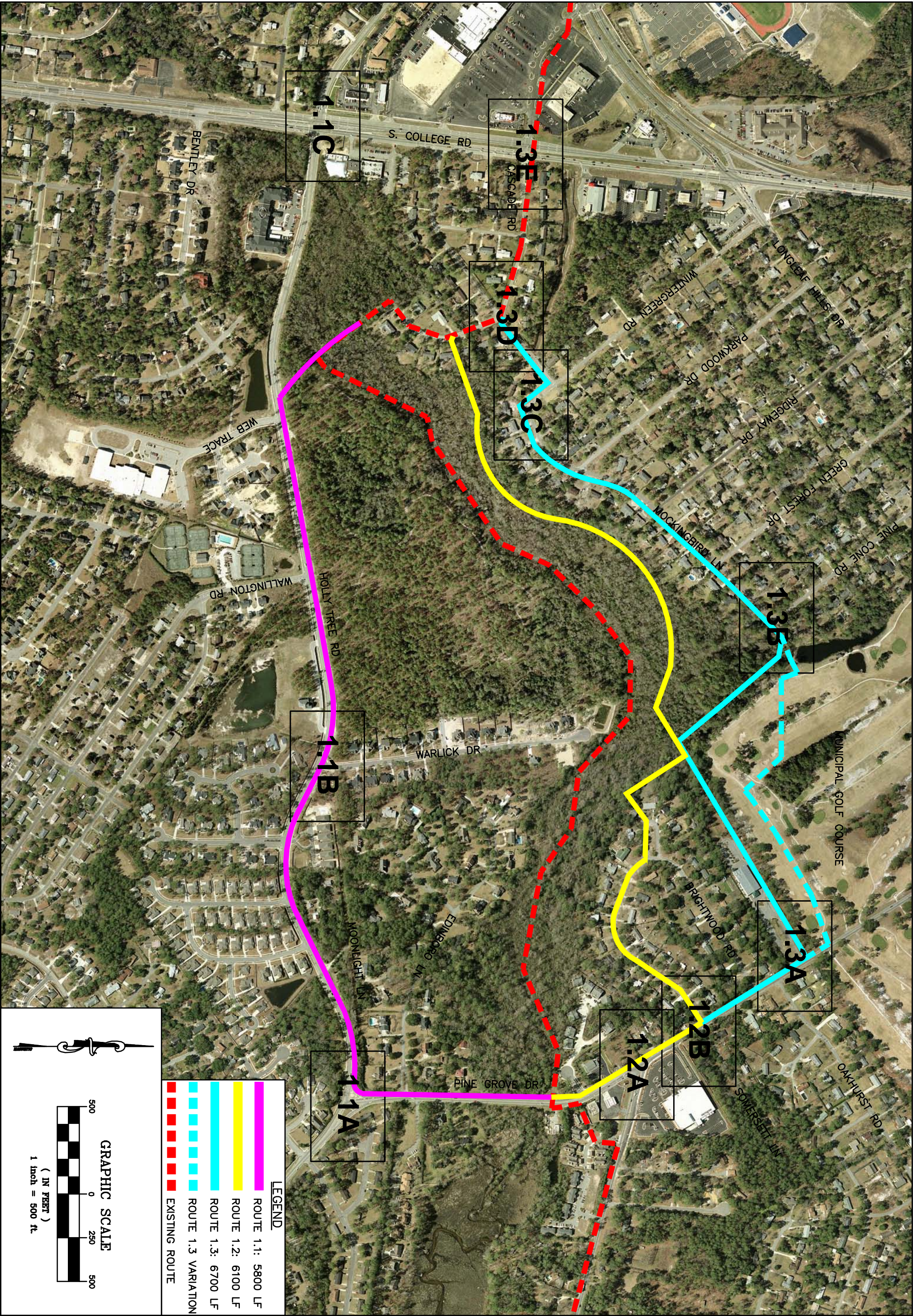
Item	Item Description	Unit	Estimated Quantity	Unit Price	Total Cost
1.	24" FM	LF	6,100	\$195	\$1,189,500
2.	Jack & Bore	LF	70	\$1,050	\$73,500
3.	Asphalt Replacement	SY	700	\$50	\$35,000
3.	Traffic Control	LS	1	\$5,000	\$5,000
Sub-Total					\$1,303,000
Contingency (20%)					\$260,600
Technical Services (includes easement maps)					\$307,200
Easements					\$220,000
Total Projected Cost					\$2,090,000

Table 3 - Alternative 1.3 Opinion of Probable Project Cost

Item	Item Description	Unit	Estimated Quantity	Unit Price	Total Cost
1.	24" FM	LF	6,700	\$195	\$1,306,500
2.	Jack & Bore	LF	70	\$1,050	\$73,500
3.	Asphalt Replacement	SY	1,200	\$50	\$60,000
3.	Traffic Control	LS	1	\$9,000	\$9,000
Sub-Total					\$1,449,000
Contingency (20%)					\$289,800
Technical Services					\$293,200
Easements					\$0
Total Projected Cost					\$2,030,000

FIGURES





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DATE
2/14/07

NORTHEAST INTERCEPTOR 24" FORCE MAIN RELOCATION
ROUTING ALTERNATIVES

FIGURE
DM-1.3



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EXHIBITS





Kimley-Horn and Associates, Inc.

DATE

2/14/07

PINE GROVE DRIVE AND
GREENVILLE LOOP ROAD INTERSECTION AREA

EXHIBIT
1.2A

THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, IS INTENDED ONLY FOR THE PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.



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DATE

2/14/07

PINE GROVE DRIVE AND
BRIGHTWOOD ROAD INTERSECTION AREA

EXHIBIT
1.2B

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WILMINGTON
MUNICIPAL GOLF
COURSE

AMERICAN LEGION
PROPERTY

PINE GROVE DRIVE

ELECTRIC
BOX



Kimley-Horn and Associates, Inc.

DATE

2/14/07

PINE GROVE DRIVE
AMERICAN LEGION AREA

EXHIBIT
1.3A

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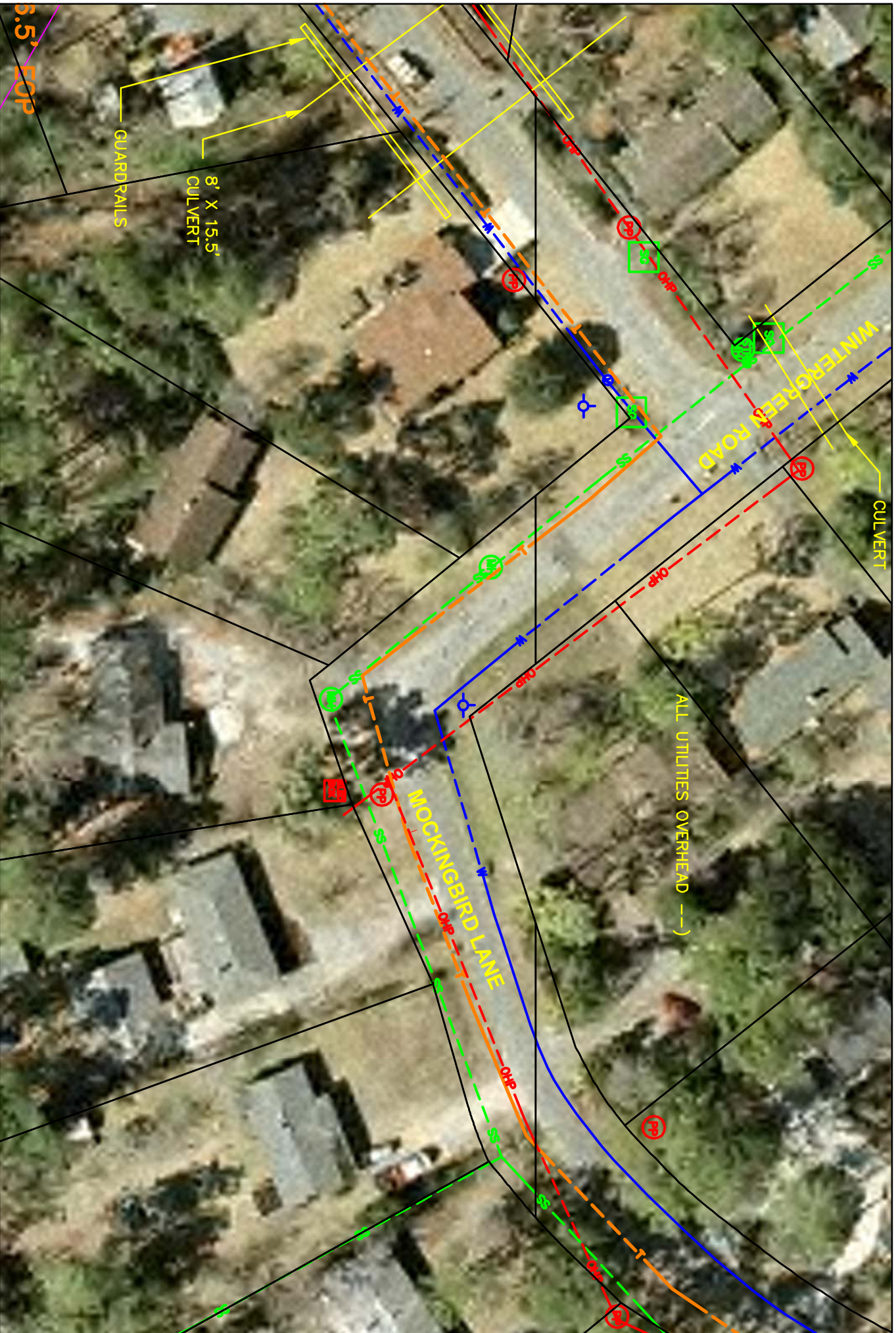
DATE

2/14/07

MOCKINGBIRD LANE AND
PINE CONE ROAD INTERSECTION AREA

EXHIBIT
1.3B

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2/14/07

MOCKINGBIRD LANE AND
WINTERGREEN ROAD INTERSECTION AREA

EXHIBIT
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